

### STPS640C

### Power Schottky rectifier

#### Main product characteristics

I <sub>F(AV)</sub>	2 x 3 A
V <sub>RRM</sub>	40 V
T <sub>j</sub> (max)	150° C
V <sub>F</sub> (max)	0.57 V

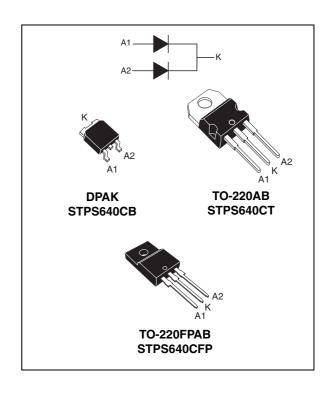
#### Features and benefits

- Very small conduction losses
- Negligible switching losses
- Extremely fast switching
- Low forward drop voltage
- Low capacitance
- Low thermal resistance
- Insulated package: TO-220FPAB Insulating voltage = 2000 V DC Capacitance = 12 pF
- Avalanche capability specified

#### **Description**

Dual Schottky rectifier suited to Switch Mode Power Supplies and other Power Converters.

This device is intended for use in low and medium voltage operation, and particulary, in high frequency circuitries where low switching losses are required (free wheeling and polarity protection).



Characteristics STPS640C

#### 1 Characteristics

Table 1. Absolute ratings (limiting values, per diode)

Symbol	Parameter			Value	Unit
V <sub>RRM</sub>	Repetitive peak reverse voltage			40	V
1	RMS forward voltage	TO-220AB /TO-220	0FPAB	10	Α
I <sub>F(RMS)</sub>	nivio ioiwaid voltage	DPAK		6	^
		TO-220AB	T <sub>c</sub> = 135° C		
I <sub>F(AV)</sub>	$I_{F(AV)}$ Average forward current $\delta = 0.5$	TO-220FPAB	T <sub>c</sub> = 130° C	3	Α
		DPAK	T <sub>c</sub> = 120° C		
I <sub>FSM</sub>	Surge non repetitive forward current	t <sub>p</sub> = 10 ms Sinusoidal		75	Α
I <sub>RRM</sub>	Repetitive peak reverse current	t <sub>p</sub> = 2 μs square F = 1 kHz		1	Α
P <sub>ARM</sub>	Repetitive peak avalanche power $t_p = 1 \mu s T_j = 25^{\circ} C$		1300	W	
T <sub>stg</sub>	Storage temperature range			-65 to + 150	° C
T <sub>j</sub>	Maximum operating junction temperature			150	° C
dV/dt	Critical rate of rise of reverse volta	ıge		10000	V/µs

Table 2. Thermal resistances

Symbol	Parameter			Value	Unit
В	R <sub>th (j-c)</sub> Junction to case	TO-220AB / DPAK	Per diode Total	5.5 3	°C/W
□th (j-c)		TO-220FPAB	Per diode Total	5.5 5.2	C/VV
D	P. Coupling	TO-220AB		0.5	°C/W
R <sub>th(c)</sub> C	Coupling	TO-220FPAB		3	C/VV

When the diodes 1 and 2 are used simultaneously:

 $\Delta T_j(diode 1) = P(diode 1) \times R_{th(j-c)}(Per diode) + P(diode 2) \times R_{th(c)}$ 

Table 3. Static electrical characteristics (per diode)

Symbol	Parameter	Test Conditions		Min.	Тур.	Max.	Unit
I <sub>B</sub> <sup>(1)</sup>	Reverse leakage current	T <sub>j</sub> = 25° C	$V_R = V_{RRM}$			100	μΑ
'R`	Reverse leakage current	T <sub>j</sub> = 125° C			2	10	mA
	V <sub>F</sub> <sup>(1)</sup> Forward voltage drop	T <sub>j</sub> = 25° C	I <sub>F</sub> = 3 A			0.63	
V_(1)		T <sub>j</sub> = 25° C	I <sub>F</sub> = 6 A			0.84	V
v <sub>F`</sub>		T <sub>j</sub> = 125° C	I <sub>F</sub> = 3 A		0.5	0.57	
		T <sub>j</sub> = 125° C	I <sub>F</sub> = 6 A		0.67	0.72	

<sup>1.</sup> Pulse test: tp = 380  $\mu$ s,  $\delta$  < 2%

To evaluate the conduction losses use the following equation:

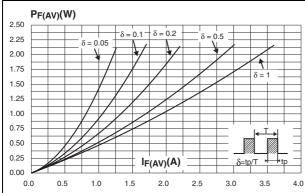
$$P = 0.42 \text{ x } I_{F(AV)} + 0.050 I_{F}^{2}_{(RMS)}$$

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STPS640 Characteristics

Figure 1. Average forward power dissipation versus average forward current (per diode)

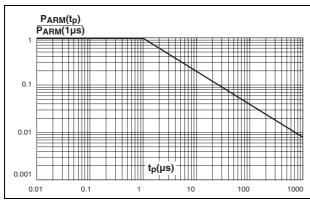
Figure 2. Average forward current versus ambient temperature  $(\delta = 0.5, \text{ per diode})$ 



I<sub>F(AV)</sub>(A) 4.0 3.5 TO-220AB / DPAK 3.0 2.5 2.0 1.5 1.0 0.5 Tamb(°C) δ=tp/T 0.0 75 50 0 100

Figure 3. Normalized avalanche power derating versus pulse duration

Figure 4. Normalized avalanche power derating versus junction temperature



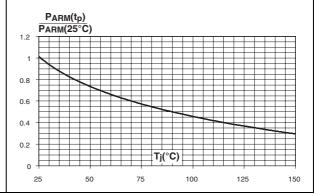
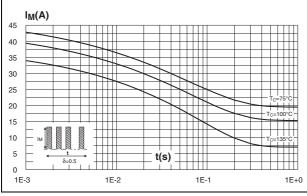
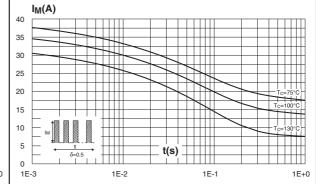


Figure 5. Non repetitive surge peak forward current versus overload duration. (Maximum values, per diode) (TO-220AB / DPAK)

Figure 6. Non repetitive surge peak forward current versus overload duration. (Maximum values, per diode) (TO-220FPAB)

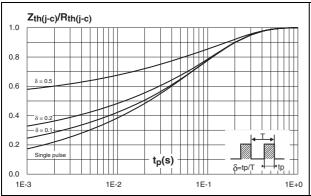




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Figure 7. Relative variation of thermal transient impedance junction to case versus pulse duration (TO-220AB/DPAK)

Figure 8. Relative variation of thermal impedance junction to case versus pulse duration (TO-220FPAB)



Zth(j-c)/Rth(j-c)

0.8

0.6

0.6

0.7

0.8

0.9

0.9

0.0

1E-3

1E-2

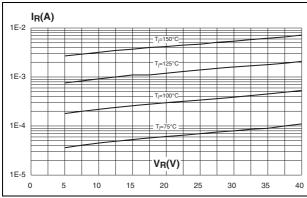
1E-1

1E+0

1E+1

Figure 9. Reverse leakage current versus reverse voltage applied (typical values, per diode)

Figure 10. Junction capacitance versus reverse voltage applied (typical values, per diode)



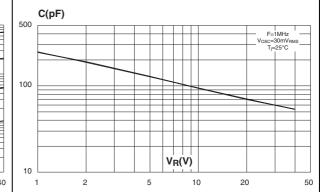
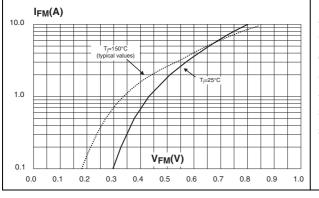
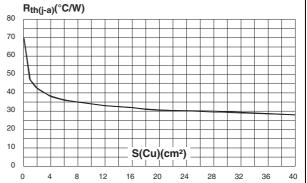


Figure 11. Forward voltage drop versus forward current (maximum values, per diode)

Figure 12. Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, copper thickness: 35 µm)





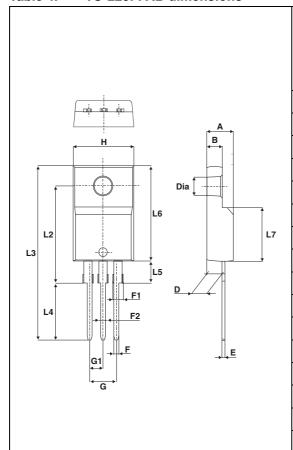
STPS640 Package information

### 2 Package information

Epoxy meets UL94, V0

Cooling method: by conduction (C)
 Recommended torque value: 0.55 Nm
 Maximum torque value: 0.70 Nm

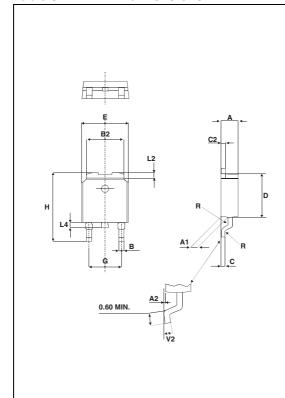
Table 4. TO-220FPAB dimensions



	Dimensions				
Ref	Millin	neters	Inc	hes	
	Min.	Max.	Min.	Max.	
Α	4.4	4.6	0.173	0.181	
В	2.5	2.7	0.098	0.106	
D	2.5	2.75	0.098	0.108	
Е	0.45	0.70	0.018	0.027	
F	0.75	1	0.030	0.039	
F1	1.15	1.70	0.045	0.067	
F2	1.15	1.70	0.045	0.067	
G	4.95	5.20	0.195	0.205	
G1	2.4	2.7	0.094	0.106	
Ι	10	10.4	0.393	0.409	
L2	16	Тур.	0.63	Тур.	
L3	28.6	30.6	1.126	1.205	
L4	9.8	10.6	0.386	0.417	
L5	2.9	3.6	0.114	0.142	
L6	15.9	16.4	0.626	0.646	
L7	9.00	9.30	0.354	0.366	
Dia.	3.00	3.20	0.118	0.126	

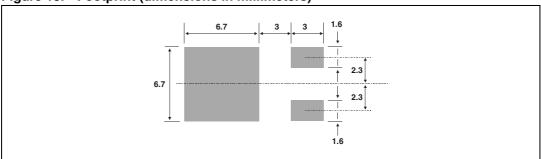
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Table 5. DPAK dimensions



	Dimensions				
Ref	Millimeters		Inc	hes	
	Min.	Max.	Min.	Max.	
Α	2.20	2.40	0.086	0.094	
A1	0.90	1.10	0.035	0.043	
A2	0.03	0.23	0.001	0.009	
В	0.64	0.90	0.025	0.035	
B2	5.20	5.40	0.204	0.212	
С	0.45	0.60	0.017	0.023	
C2	0.48	0.60	0.018	0.023	
D	6.00	6.20	0.236	0.244	
Е	6.40	6.60	0.251	0.259	
G	4.40	4.60	0.173	0.181	
Н	9.35	10.10	0.368	0.397	
L2	0.80 typ.		0.03	1 typ.	
L4	0.60	1.00	0.023	0.039	
V2	0°	8°	0°	8°	

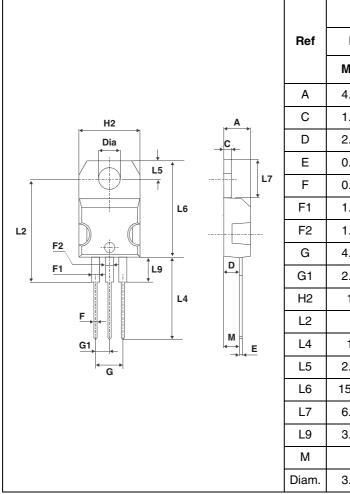
Figure 13. Footprint (dimensions in millimeters)



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STPS640 Package information

Table 6. TO-220AB dimensions



	Dimensions				
Ref	Millimeters		Inc	hes	
	Min.	Max.	Min.	Max.	
Α	4.40	4.60	0.173	0.181	
С	1.23	1.32	0.048	0.051	
D	2.40	2.72	0.094	0.107	
Е	0.49	0.70	0.019	0.027	
F	0.61	0.88	0.024	0.034	
F1	1.14	1.70	0.044	0.066	
F2	1.14	1.70	0.044	0.066	
G	4.95	5.15	0.194	0.202	
G1	2.40	2.70	0.094	0.106	
H2	10	10.40	0.393	0.409	
L2	16.4	typ.	0.645 typ.		
L4	13	14	0.511	0.551	
L5	2.65	2.95	0.104	0.116	
L6	15.25	15.75	0.600	0.620	
L7	6.20	6.60	0.244	0.259	
L9	3.50	3.93	0.137	0.154	
М	2.6	typ.	0.10	2 typ.	
Diam.	3.75	3.85	0.147	0.151	

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

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Ordering information STPS640C

# 3 Ordering information

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
STPS640CT	STPS640CT	TO-220AB	2.20 g	50	Tube
STPS640CB	S640C	DPAK	0.30 g	75	Tube
STPS640CB-TR	S640C	DPAK	0.30 g	2500	Tape and reel
STPS640CFP	STPS640CFP	TO-220FPAB	2.08 g	50	Tube

## 4 Revision history

Date	Revision	Description of Changes
Aug-2003	6B	Last release.
22-Mar-2007	7	Removed ISOWATT package.

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